Paſsd March 14 18

Phytochemia,
or
A Dissertation
on Inland vegetable Chemistry;
with researches
on the proximate principles of plants;
submitted, as an inaugural thesis,
to the examination of
the Medical Faculty of the University
of Pennsylvania,
by Columbus. C. Conwell of Pennsylvania
March 1829.

South West Corner of Fourth & Spruce Sts

Pensa e mira
Quanto è varia natura, e quai tesori
Offre al' uom che la studia e che l'ammira.

Inscribed
to my Receptor,
Dr Samuel Jackson,
as a testimony
of the sincere regard,
and respectful attachment,
I have ever entertained for him.

These numberleſs varieties of animals that wander on the earth, dwell in the wave, or soar upon the breeze; these stately trees; these delicate flowers, whose fragrance enchants the sense, & whose rich tints embellish the surface of our globe; these burnished metals; these sparkling gems; these stupendous rocks, at whose crystallization the lightnings attended, & the waters were ancillary: these marvellous combinations, infinitely varied, infinitely modified,—these are so many links in the sublime chain of entities composing the universe.

To compare them in the range of aſsociation, to study their contrasts, & to *feel* their harmonies, is the object of the Philosopher.

To arrange them into kingdoms, to determine their orders, to fix their genera, & to subdivide them into species, is the duty of the Naturalist.

To analyze their structure, to resolve them into their principles, to ascertain their properties, & to isolate their elements is the office of the Chemist.

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Mineral Chemistry has nearly monopolized the attention of investigators; probably because it is more exempt from confusion in its data, & leſs complex in its products, than its sister sciences; for such elements as analysis can insulate, synthesis can recombine. This is not the case in vegetable Chemistry, nor can we ever hope to form in our laboratories substances, developed by the long & inceſsant work of Organization — we may destroy but cannot reproduce — we may analyze but cannot effect a similar aſsemblage of particles, unaided by the phenomena of vitality.

In the mineral kingdom, substances may be said to combine 2 by 2; in the vegetable, 3 by 3: namely: oxygen, hydrogen, carbon: & in the animal, where this gradation of Complication is at its maximum, 4 by 4 Viz: oxygen, nitrogen, hydrogen, carbon. The chain of affinities connecting these principles is leſs durable as their compli-

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cation increases: Hence in the two last mentioned kingdoms are observed the spontaneous phenomena of fermentation in the one, & putrefaction in the other, on the ceſsation of *life*—that principle which, as it were, agglutinates the organic molecules.

The importance of vegetable Chemistry may be duly appreciated, when we reflect that the object of our study is one which confers on animals the bleſsing of life, by presenting us with every species of nutriment, & probably furnishing our atmosphere with its *exclusive source of oxygen*. This harmonious dependence of animals on vegetables, & vice versa, is worthy of observation—They exhale oxygen, a fluid deleterious to vegetables; we inhale it, as a stimulant to vitality—they inspire Carbonic acid, as an aliment; we expire it, as a poison—we sustain life by consuming substances which they reject as superfluous or diseased;

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their [illegible] [illegible] [illegible] [illegible] and [illegible] of animals. This delicate harmony [illegible] are designed so intimately together that the absence of the one would [illegible] the [illegible] destruction of the other.

Indefatigable & successful as have been the exertions of Chemists in the vegetable department of this science, it is singular that no one has yet presented us with a judicious or even rational classification — an object of primary importance in every branch of Study, for without a definite arrangement we labour in the dark, & all our inferences are liable to be considered vague erroneous & empirical. Thus, Vegetable Chemistry has been arranged by some into products "soluble & insoluble" by others into "inflammable and incombustible" — these & a myriad of others equally philosophical merit all the popularity they have obtained & scarce deserve to be noticed. I have seen one scheme

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of arrangement which I intend partially to imitate. It was composed by J. J. Virey an elegant French writer and accomplished pharmacologist; it is a bold & happy attempt at a correct onomatapaeism.

It is foreign to my design to touch on the Physiological phenomena of vegetables— their phases of increase—their periods of declension—their method of germination—their roots—trunks—branches—their leaves, whose superior surface is exhalent, & whose inferior is absorbent,—these researches belong to the botanist. Nor shall I wander with St. Pierre* thro the poetic maze of Romantic enthusiasm, to admire with him in the simple flower the anthera suspended by white fillets poised by double rafters of gold on pillars of ivory; the corolla, an arch of boundless magnitude, adorned with the ruby and the topaz; the glands superb flagons of amethyst, pouring from their gullets of diamon

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* Etudes de la [illegible]

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ingots or liquid gold. As far however as Chemistry is concerned in the developement of some changes which occur in plants, I shall conceive it my province to speak.

The principal sources of Nutriment are furnished to Vegetables by water, heat, light, Carbonic acid & perhaps earth.

Moisture is a stimulant so essential to plants that without it they languish & die. This fact is finely illustrated in the case of the onion Squill &c which perform the functions of life while suspended in a moist atmosphere. In the burning deserts of Arabia, whose soil sun-parched & sandy affords no vestige of vegetation, the wanderers eye is occasionally delighted with the prospect of Isles of verdure (oasis) which appear around the margin of springs. The sun flower is said by Ray to exhale a quart of water in 24 hours; and Navarette in his account of China makes

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mention of a vine called the Bejuco, from whose fruit or melon, when punctured, there exude several quarts of cool limpid water. The grape vine & waterwith of Jamaica afford a clear refreshing water on being cut. Paſsing thro' the aſsimilative organs, water suffers decomposition; the oxygen is evolved while the hydrogen remains to form the base of oils, wax, resins &c.

Heat is also a neceſsary stimulant. Vegetable nature is more vigorous in tropical than in polar climates: hence we find that warm countries abound in large trees and forests, whilst shrubs underwood, & arbustæ are the only kind of vegetables met with in cold regions. Nay the very plant whose size and majesty render it the pride of British groves when transported to the soil of Lapland degenerates becomes small, wrinkled & contracted: because the rapid

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of digestion is proportionate to the intensity of the heat.

Light possesses considerable influence on vegetation. The ray emanating from a lamp produces an effect analogous to the sun-beam.

Earth. Can the substance of the earth tho' often regarded as the most indispensable aliment be considered nutritious? An ingenious experiment of Van Helmont seems to set the question at rest. He dried 200 pounds of earth and in it planted a willow weighing two pounds. In order to secure it from the admission of other earth he covered it with a perforated tin hemisphere, carefully watering it with distilled water twice a day for five years. After the lapse of that period, the willow was found to weigh one hundred and sixty nine pounds, & the earth had lost but two ounces. From this experiment it is certain that

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that vegetables receive little or no nutrimental matter from the earth. The experiment just cited gives origin to a more important Chemical question: from what source could the willow have derived the many pounds of Potassa which it must have contained? Potash is not volatile it could not have procured it from the atmosphere, and certainly not from the distilled water. Is potassium really elementary, or could it have been developed in the plant by gaseous combination assisted by organic action? Does potash exist in plants during vegetation*? If so, why can we neither detect it by our tests nor extract it by our acids? If not, have we not every reason to believe that it is literally generated by combustion? I confess myself sceptical enough to

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doubt whether potash exists ready formed with Charcoal; for how comes it that after extracting from Charcoal all matter capable of reacting with the acids we can afterwards convert it partly into potassa by ignition & combustion? I feel perfectly convinced tho I never performed the experiment that Carbon precipitated from Cyanogen or from Prussic acid would if burned leave a residue of Potash: and who would be ingenious enough to maintain that the alkali pre-exists in hydrocyanic acid?

It would be deemed romancing in me to risk the hypothesis that charcoal & potassa have the same metallic base differing only in degree of oxidation; and yet they are both combinations of oxygen with a known base— The Potassium of Davy & the Carbonium of Doebereiner are described with properties precisely analogous, & I am confident, th

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are identic for during Curaudau's process the Charcoal was oxidized & converted partly into potash from which the base Carbonium was obtained. The prosecution of this digression from my subject would involve a discussion on the elementarity of metals and tho' not strictly connected with vegetable Chemistry, I cannot help expressing my firm belief that it is highly probable, if not unquestionably certain, ~~that the metals~~ from the experiments of Priestley[a] & Guiton Morveau[b] as well as from the observations

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[a] Dr. Priestley reduced copper to a light combustible charcoal which he had distinguished by the name of Metallic Charcoal.
Vide Encyclop: article—Charcoal.

[b] Guiton Morveau, in a paper read before the french institute—Floreal 6th Anno 3d attempts to prove that the alkalies are combinations of simple gases.

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of Ulloa* that metals are not simple bodies and that Chemistry will some day or other teach men to analyze & to reproduce them. The attempt of the Alchemists to discover the method of making gold the lapis lazuli & the philosophers stone was not half so absurd as our philosophers would have it. Had they possessed like us the sweeping advantages of analogy & induction their investigations might have been crowned with success: but accident may might develope what study & research never can. Newton's apple, Galvani's frog, & a Child's lens have flung open the doors of the most gorgeous treasury of science that has ever enriched the human intellect.

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*Ulloa, the Philosophic traveller, declares his conviction that the elementary parts of gold are uniform from many curious circumstances detailed in the second volume of his voyage.

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The following is the scheme of Claſsification, I shall adopt throughout this treatise.

Claſs. Phytochemia from φυτος a plant.
Order I. Inland Phytochemia.
Order II. Marine Phytochemia.

It is much to be regretted that chemical attention has never been directed to marine vegetables. They certainly present a wide & brilliant field for philosophical research — two of our most interesting products, Soda & Iodine are derived from the sea weed.

Division of Order I:

Genus I. Anthracia, from ανθραξ Carbon.
Genus II. Hydrogenia.
Genus III. Oxygenia.
Genus IV. Nitrogenia.
Genus V. Hydroxygenia.

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Genus I. Anthracia.

Under this head are comprehended all proximate principles in which Carbon predominates.

Species I

Lignin. The semi fibrous tissue constituting the parietes of the vegetable vessels, after desiccation & extraction of all soluble matter by water & alchohol, is denominated lignin. It contains 52 parts of Carbon in 100 affords by distillation acetic acid combined with an empyreumatic oil (pyroligneous acid) and produces, when treated with nitric acid artificial tannin colouring matter & oxalic acid. Braconnot's experiments relative to the convertibility of lignin into Sugar are perhaps the most curious & interesting ever recorded in the archives of Chemistry. Lignin, heated with its own weight of Caustic

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potash affords a substance of easy solubility, analogous to Ulmin.

Species 2.

Suberin. This term is applied to the outer bark of the Cork tree. From Lignin it may be distinguished by its greater combustibility, its specific lightness & its compressibility; but chiefly by its being convertible into a peculiar acid substance the Suberic; by reaction with nitric acid. Boiled in alcohol & evaporated Suberin affords a crystalline principle called by its discoverer Cerin — for distinction sake it has since been entitled Suber-Cerin. By distillation I procured from Cork an aromatic acid which may be called pyro-Suberic with the same propriety as the disguised acetic acid of Lignin has been termed pyroligneous.

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Goſsypin. Cotton is certainly a peculiar principle. It h. been very trivially examined. With nitric acid it affords an acid substance resembling the Suberic.

Species 4

Fungin. The tissue of the mushroom possesses properties which entitle it to a separate consideration. It is inelastic, insoluble in water, alcohol or ether, soluble in the alkalies & in nitric acid which converts it into a ceruminous mass.

Species 5.

Tannin. The vegetable astringent principle may be obtained by pouring lime water on a strong solution of tan. The tannate of lime is formed, & may be decomposed by nitric acid which uniting with the lime separates the tannin. After filtration there remains a black pulverulent subst. ce which has been described as pure tan, (Ure

According to Proust & Lagrange, Tannin may be obtained in all its purity by precipitation or from an infusion of galls by carbonate of Ammonia. The principal peculiarity of tan is that of forming an insoluble compound with gelatine. It is a brownish black powder soluble in water. There is however a species of tan existing in the [illegible] which is soluble in alcohol alone*.

Artificial tannin is formed by reaction of nitric acid with charcoal, lignin & several vegetable substances.

Species 6

Chlorophyllin. This name of Greek origin being derived from χλωρος green & φυλλον a leaf. The green colouring matter of the leaf, erroneously represented as a resin forms a peculiar principle abounding in

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* Journal de [illegible] Tannin. [illegible]

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Hydrogen. It may be obtained by digesting bruised green leaves in highly rectified alcohol; after a slow evaporation of the alcoholic solution a splendid green substance remains. Thus obtained it may be distinguished by the following properties: it is soluble in alcohol oil & ether insoluble in water & burns like a resin; it is discolored by Chlorine & Iodine, is dissolved without alteration by Sulphuric acid, strikes a green yellow hue with hydrochloric & a green with nitric acid unattended by the production either of mucic or oxalic acids—

Lecture 7—

Gum-Resin. This term is obviously erroneous being not only vague & gratuitous but calculated to ~~mislead~~ ~~[illegible]~~ impress on the mind the idea of a compound formed of a gum and a resin. Sugar might be termed a gum resin with propriety as [illegible].

There exists not in Nature, nor can there be produced by art, any immiscible combination of Resin & Mucilage without the interposition of some chemical reagent. Why then will not the chemists furnish us with a title less calculated to mislead?

All substances classed under this head are obtained by spontaneous separation from natural fissures or incisions made into the trees which afford them. They are soluble in water, oil & alcohol & may be converted by the stronger acids into artificial tannin & charcoal. They appear at first under the form of a milky juice & subsequently indurate; such for example are aloes, Assafoetida, Gumboge, Olibanum, Galbanum, ammoniacum, scammony &c.

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Genus II

Hydrogenia.

All proximate principles or matters under this genus are inflammable from the predominance of Hydrogen. Their specific gravity is less than that of water.

Species I

Ceruminous matter.

a. Beeswax. Whether beeswax be a vegetable secretion or the product of animal elaboration is a point yet remaining in argue & it is highly amusing to observe with what animated hostility this nugatory contention has been maintained. Beeswax is found on the superior surface of leaves & on the anthers of flowers; commonly however it is obtained from the bee-hives in which it is found disposed in hexagonal cells. Sparrman[†] speaks of wax in

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Sparrman's voyage to the Cape.

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much reason that it is deposited on the berries of the Myrica Cerifera by insects.§ Du Halde* alleges that a tree in China called Tong Sing is absolutely coated with a white wax formed there by insects. But travellers are naturally chartered to deal in the mythic & the marvellous, and to them as well as to painters & to poets Quidlibet audendi semper fuit aequa potestas. A *sterling* Chemical evidence that wax does not belong to the animal kingdom is the absence of Nitrogen.

Beeswax is straw coloured, insipid, insoluble in water, soluble in the fixed oils, inflammable, fusible at 155 rendered saponaceous by the alkalies unaffected by the acids and bleached by exposure to Chlorine & to atmospheric air. It is partially soluble in boiling alcohol water & ether. Dr. John has contrived the term Cerin, to denote

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that portion of wax which diſsolves in the aforementioned menstruum when hot, & the term myricin to designate the residue which under all circumstances is insoluble.

The following is the result of a few experiments which I performed with a view to ascertain whether beeswax resisted the action of our stronger Chemical reagents. Immersed in boiling nitric acid a certain portion of it, probably the cerin, entered into solution the rest remained fluid on the surface and on refrigeration the whole of it became concrete white and semidiaphanous.

Treated in the same manner with hydrochloric acid, similar phenomena were developed.

Boiled with sulphuric acid, its tiſsue and ceruminous character were destroyed.

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it acquired a greenish black colour, a saponaceous greasy feel, & a taste like that of an acid soap; its inflammability being materially impaired.

About twelve parts of soap were heated to fusion with one of sulphur in a Florence flask, a neutral combination resulted. This compound was heavier than water more brittle than soap, of a shining metallic lustre and assumed a rich dark purple hue. Formed into a taper with cotton wick it burned with great brilliancy.

Sapocerin. I have presumed to attach this name to a singular compound of acid and elain analogous in all its chemical relations to beeswax. I obtained it from soap by the following process: fine white soap was triturated with water until the whole acquired a gelatinous consistency — Being heated in the sand bath & a few drops of nitric acid poured upon it, it instantaneously separated into two portions. the one limpid, the other bituminous and insoluble. After boiling each for some time I ~~separated~~ a yellow

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matter separated thoroughly. From the striking resemblance it bore to beeswax I repeated on it every experiment I had performed on the subject of wax, in order to ascertain whether it would coincide with wax in chemical analogy as well as in external appearance. My results were decidedly satisfactory, & induced me in believing that this substance was with trifling modification, endowed with every property and character of Beeswax.

Myricin is of a reddish yellow colour, unaffected by the acids. Slightly unctuous, insoluble in water alcohol or ether; its specific gravity being about .96 & its point of fusion below that of beeswax.

Adipocire, discovered by Braconnot in the [illegible] is solid white & entirely soluble in boiling alcohol from which it separates on refrigeration.

Species 2.

Fixed oils. These oils are commonly obtained by expression & may be known by the following properties: They are viscid, insipid, immiscible

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with water lighter than water heavier than alcohol form soaps with alkalies dissolve sulphur phosphorus caoutchouc & the resins are incapable of assuming the aeriform state without decomposition convertible by weak nitric acid into a kind of wax & resin and may be decomposed by chlorine which uniting with their hydrogen renders them concrete.

Two immediate principles elain & stearin have been separated from these oils by congelation & pressure between folds of the spongy paper. During the process of Saponification, stearin produces margaric, and elain oleic acids.

Olive oil consists of Stearin 28
Elain 72
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The decomposition of the sweet principle of Scheele or vegetable mucus, which all these oils contain is alleged by some to be the cause of their rancidity. Dr Hare supposes rancidity to result from a slow combustion during which oxygen is absorbed.

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The oxidation of the oil may be accelerated by the decomposition of the mucus.

From the necessary presence of a certain temperature & the rapid generation of acetic acid, I thus attribute the phenomenon to the process of fermentation which indeed is but another term for Accelerated Oxidation.

Some oils by exposure to the atmosphere, lose their oleaginous character inspissate & become covered with a pellicle; these are called the siccative or drying oils.

Vegetable Butters might be mentioned in this stage of the discourse but as they evince no striking ~~Characteristic~~ peculiarities & as I conceive they differ from fixed oils merely by being principally composed of Stearin which renders them concrete at atmospheric temperatures I shall waive the consideration of them.

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Species 3.

Etherial oils.

There is a class of oils, never before noticed which can neither be obtained by expression nor distillation, but by digesting such substances as afford them in Ether & leaving that menstruum to spontaneous evaporation. As they differ in appearance & chemical relation from all other immediate oils resembling rather naphtha or petroleum, I have thought proper to denominate them from the fluid thro' whose instrumentality they were obtained Etherial oils – a term formerly synonymous with volatile oils but happily for my purpose that application of the term is obsolescent.

They are yielded by all articles in which the aromatic quality predominates, and may be distinguished by the following properties: Their consistency is bituminous their ~~odour~~ colour various, their odour penetrating & their taste intolerably.

warm & acrimonious! They afford to distillation impure acetic or empyreumatic acid in combination with a volatile, or more properly a pyro-etherial, oil far less powerful than themselves: a considerable portion of their aromatic principle being decomposed, or obtunded by assuming the gaseous form.

Etherial oil of Capsicum is perhaps the warmest & most penetrating substance known in nature. I make no doubt but it will be applied internally to disease or to purposes of endermic medication with the most decided advantages.

Eth: oil of Pepper, obtained by Mr E. W. Carpenter of Philadelphia, concentrated all the acrimony and penetrating heat of Black pepper & to this principle not to the piperin, is to be referred the stimulant action of the substance producing it.

Eth: oil of Cloves communicates to the smell an odour highly fragrant & to the taste, an agreeably stimulating warmth.

Eth: oil of mustard is composed chiefly of Stearin

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With regard to the Eth: oils of Allspice, Ginger, Caraway, Calamus aromaticus Nutmeg, Cubebs, and others which I obtained it is only neceſsary to state that they embody all the sensible & medicinal properties of their respective plants.

Synchronously with the developement of most of these oils a neutral crystalline substance appears on the sides of the veſsel.

Species 4.

Volatile or Pyro=etherial oils

Most of the volatile oils are obtained by distilling in the Italian recipient, with water such substances as produce them while a few are obtained by expreſsion, as oil of Lemon, orange, and bergamot. They poſseſs a penetrating odour & a warm aromatic taste are volatilised at common temperatures, and inspiſsate into resins & lose their aroma by oxygenation.

The vol: oils are divided by Virey into 3 orders:

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1° the light oils, as oil of thyme, rosemary, savine &c most of which deposit crystals of camphor.

2° the heavy, as oil of Cinnamon, Cloves, mace &c most of which deposit crystals of Benzoic acid;

3° the concrete as butter of roses, anniseed, fennel &c for the distillation of which warm water is required in the refrigerant vessel.

These oils are all empyreumatic & acid; they redden litmus & may be rendered miscible with water by sugar or mucilage. They precipitate gold in its metallic state from its nitro-muriatic solution, as do also camphor, turpentine & phosphorus. They inflame by reaction with nitrous acid & leave a spongy carbonated mass, called the philosophic mushroom. When a current of Hydrochloric Acid gas is passed thro' a volatile oil, a crystalline matter analogous to Camphor falls. This deposit has been called artificial Camphor.

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Species 5.

Resins may be regarded as concrete volatile oils. In a state of purity, they are friable, vitreous, inflammable, insipid, & inodorous. Such of them as possess savour or odour derive it from an essential oil or benzoic acid. They are insoluble in water, soluble in oils, alcohol, ether, acids & alkalies. Acetic & hydrochloric acids dissolve them without decomposition, sulphuric acid destroys them, & nitric acid converts them into a bitter yellow matter entitled, in honor of its discoverer, the Bitter principle of Welther — a portion of nitric acid & artificial tannin are simultaneously produced. Bonastre, who analyzed the natural resins with extreme accuracy & minuteness, found them to contain: 1° a resin properly so called, translucent and soluble in cold alcohol, 2° an acid, sometimes acetic and occasionally succinic; 3° an essential oil 4° a bitter matter; 5° a sub resin, opaque, crystallizable, & nearly insoluble in boiling alcohol. The [illegible]

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appears to bear to resins what elain & stearin are to fixed oils.

a. Guaiacum is partially soluble in water, & becomes successively green blue & brown by exposure to atmospheric oxygen. It may be rendered blue by trituration with gum arabic, or by Zimome.

b. Feruline. This term is applied to the resinous portion of Assafoetida gum ammoniac &c. It becomes rubescent by exposure to the atmosphere, & strikes a red colour with silver.

c. The bitter resins, or aloeresinoids, found in Colocynth, elaterium scammony & most of the parenchymatous extracts are termed resinoids or combinations of substances resembling resins with a bitter neutral principle.

d. The terebinthinates are resins rendered semi-fluid by an essential oil which may be separated by distillation. The balsams are resins impregnated with benzoic acid, which may be distinguished by

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Sublimation.

Species 6

Camphor. This singular substance may be regarded as intermediate between resins and volatile oils: like the former, it is light solid and inflammable soluble in alcohol oil and ether, like the latter it is volatile, aromatic, & nearly insoluble in water.

Camphor is concrete crystalloid, white, semi-diaphonous, volatile & combustible. It has the property of arresting the progress of fermentation & putrefaction in vegetable bodies. Its principal peculiarity is that of forming by repeated distillation with nitric acid an acid substance grouped in [illegible] crystals entitled the Camphoric.

Genus III

Nitrogenia.

This genus comprehends all immediate principles containing nitrogen.

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For the sake of a definite nomenclature I ~~ko~~ shall annex the ~~the~~ termination a or ia to such principles as are alkaline and the termination in to such crystalizable products as are neutral.

Species 1

Gluten. This name is given to that portion of farina which remains after all the Starch is washed away, by forming it into a paste & continuing repeatedly with cold water. It was first observed by Beccaria & Kessel meyer. & it may be known by these properties viz it is a flabby tenacious, grey substance soluble in most of the acids & caustic alkalies and susceptible of acetous and putrid fermentation. After desiccation it becomes hard & vitreous and when heated produces Ammonia, [illegible] and Carbonic acid Sulphuretted hydrogen and empyreumatic oil. With alkalies it forms an imperfect soap, and agrees with albumen.

which dissolves a portion of it, a fine yellow varnish. The portion of Gluten soluble in alcohol has recieved from Taddei the appellation of Gliadine: the insoluble portion that of Zimome. The latter is found in little spherules which adhere to each other with difficulty and exhale the odour of putrescent urine. Gliadine when dry is brittle yellowish & transparent. It is again, divisible into two portions; and were it worth the expenditure of time ink or paper to attach pompous academical names to products in themselves so negatory (the most effectual mode of turning Chemical Science into ridicule) I might, pursuant to the example of the Taddeian School & with equal propriety subdivide his gliadine into two portions — the one in a [illegible] of [illegible] soluble in boiling alcohol the other in [illegible]

Species 2

a Albumen. This substance bears a

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very intimate resemblance to animal albumen It is found in a few vegetable juices which are milky and coagulable by heat or by acids. as in Cabbage, horse radish, turnips, poppy, lettuce, & several of the cruciferous plants. Submitted to destructive distillation it affords azotified principles. It is partially soluble in alcohol— happily for the Student of Chemistry, Taddei has not experimented on the soluble and insoluble portions.

b. Gelatine found in the pollen of the date, is incoagulable by heat, and precipitable from its solutions by an infusion of galls, with which it forms an insoluble compound.

c. Osmazome discovered by Vauquelin in mushrooms Coincides in all its properties with animal osmazome.

d. Caoutchouc is tenacious, elastic and semitransparent insoluble in water and alcohol, soluble in ether, oil & in nitric acid. It resembles gluten, & yields azote and ammonia when heated.

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Species 3.

Proximate principles which are alkaline & Crystallizable.

a. Quinia.

The alkali to which the tonic powers of quinquina are referable, was discovered by Dr Gomez, and afterwards accurately examined by Pelletier & Caventou. The following is M. Pelletier's process for obtaining it: the alcoholic extract of barks is treated with hot water rendered acidulous by hydrochloric acid and boiled down with excess of magnesia; after filtering and edulcorating with cold water, the matter which remains on the filter, digesting it in strong alcohol, and evaporating, pure quinia is deposited.

b. Cinchonia, as it exists in the pale bark, differs little from the preceding, and may be developed by a similar process

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c. Quassa.

This new vegetable alkali was detected by me in the Quassia amara, in which it is entoiled with a variety of principles as tannin, colouring matter, a peculiar new acid the Quassic and resin. It was thus isolated – One pound of powdered quassia was digested a few days in two quarts of water with about four drachms of sulphuric acid: after boiling for some time it was filtered while hot and the evaporation continued until the solution became perfectly concentrated. On refrigeration the sulphate of Quassa precipitated in snow white acicular flocks. By [illegible] boiling the sulphate in water with excess of magnesia nearly to dryness, treating the residuum with hot alcohol filtering to get rid of the Epsom salts, & slowly evaporating the alcoholic solution I obtained ure

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pure Quaſsa.

Quaſsa concentrates all the medicinal energy and bitterness of quaſsia. It is white and eminently alkaline precipitates the metallic oxides neutralises the acids and renders the tincture of alkanet blue: it is very soluble in hot alcohol less so in ether and nearly insoluble in water. It constitutes the basis of a claſs of intensely bitter salts. Per se, Quaſsa is uncrystallizable at least I could never procure it in a crystalline form.

Sulphate of Quaſsa is easily crystallizable and groups in acicular prisms. It is a permanent salt and remains solid in any quantity of cold water. In the common pharmaceutical preparation "infusum quaſsiæ cum sulphate zinci" a double decomposition takes place; the Quaſsate of zinc, and Sulphate of quaſsa being formed.

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Hydrochlorate of Quassa forms starry configurations, and is more soluble than the preceding.

Nitrate of Quassa is uncrystallizable.

Acetate of Quassa forms in silky plumose fibres.

Oxalate of Quassa aggregates in fine bundles.

d. Serpentara.

By pursuing a plan similar to that indicated for the developement of Quassa, I succeeded in isolating, from the Aristolochia Serpentaria or Virginia Snake root, a new alkali to which the tonic powers of the Virginia root are attributable. It is better in every instance first to procure the sulphate or what may be more eligible the acetate, sulphuric acid being liable, if not cautiously employed, to derange the product.

The Sulphate may be disentangled from the viscid extractive matter which obstinately aaher

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adheres to it by repeated washing and pressure between folds of bibulous paper. This salt being boiled in water with excess of Magnesia evaporated to dryness and digested in alcohol, pure Serpentara falls after ebullition and filtration. Thus obtained it appears in white and exquisitely delicate deliquescent crystals which possess a fragrant smell and a slightly bitter taste and render the Syrop of violets green.

<u>Sulphate</u> of Serpentara crystallizes in long quadrangular prisms. It is insoluble in cold water but soluble in hot water and alcohol. Hydrochlorate of Serp^{a} forms brilliant rhomboids, more soluble than the Sulphate.

Nitrate of Serpent^{a} is not susceptible of crystallization, or to speak more justly, nitric acid decomposes Serpentara as well as most of the other vegetable alkalies – at least I could never regain them after having once immersed them in that acid, however dilute.

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Serpentaria naturally exists in union with a peculiar acid named the serpentinic which I have not examined owing to the inability to procure it in sufficient quantity for purposes of investigation. The Serpentariate of lime is found in the root in union with extractive matters.

e. Columbia

Another new alkali extracted by me from the Colombo root exists in combination with a new acid the columbic, and in resin, extractive gum and mucus. From all these it may be disengaged by the process employed for the isolation of Quinia. It is white and appears in the form of shining silky needles. With sulphuric acid, it forms minute prisms, and with hydrochloric, starry points somewhat deliquescent. Nitric acid destroys its alkalinity. Combined with acetic acid it forms very fine needles resembling amianthus.

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5. Gentia

A new organic alkali which I separated from Gentian in which it exists in great quantity. The method of obtaining it does not differ from that employed for procuring the preceding alkalies. The process is exceedingly simple and I feel thoroughly convinced that all other proximate alkaline principles might be ~~[illegible]~~ obtained by the same simple method. This would save the Chemists, who seem to vie with each other in the intricacy, prolixity and unintelligibility of their formulae for obtaining these principles, an enormous deal of trouble and exonerate the mind of the Student from much perplexity and unprofitable fatigue.

Gentia embodies with little variation all the characters of Columbia. The Sulphate of Gentia, which like the Sulphate of Columbia appeared in small needleform crystals, and the Muriate, which like that of Columbia appeared in

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g. Gallia.

Besides gallic acid, ellagic acid tannin, colouring matter a green mossy substance Mucus, and extractive. there exists in the gallnut a new vegetable alkali which I obtained in small quantity by sulphuric acid.
Sulphate of Gallia is insoluble in cold water partially soluble in hot and dissolved in all proportions by in boiling alcohol, from which it descends in fine fasciculi on refrigeration.

h. Stramonia.

This alkali has been mentioned under the appellation of Daturia, and its discovery ascribed to Brande; but as neither his method of procuring it nor its properties have been described in any of our Cisatlantic publications I am warranted in believing that I present the first series of investigations on the subject of an article which will one

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day or other prove an invaluable accession to the Catalogue of remedies.

The subjoined is the process I employed for its development. The bruised seeds of Stramonium were washed in cold water and alcohol for the purpose of removing extraneous matter. Without this preliminary precaution it will be extremely difficult to separate the alkali from the mass of other substances which enter so abundantly into the composition of this seed. After repeated elutriation, it may be treated with dilute sulphuric acid and the sulphate obtained. This salt being boiled in water nearly to dryness with excess of magnesia & boiling alcohol being poured on the residue which must be filtered during ebullition pure Stramonia falls on cooling.

Stramonia crystallizes in acicular flocks which when minutely examined appear to be prisms with trapezoid bases.

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It is insoluble in cold water and alcohol but very soluble in hot alcohol.

Sulphate of Stramonia crystallizes in quadrilateral prisms.

Hydrochlorate of Stramonia assumes the form of small cubes.

Acetate of Stramonia groups in delicate needles.

The acid by which Stramonia is naturally neutralized exhales the odour of ripe apples and is perhaps malic acid.

Stramonia is an energetic narcotic poison.

i. Mahogonia.

This alkali exists in great abundance in the bark of the Swietiana mahogoni in combination with a splendid colouring principle.

The Sulphate the only preparation I have examined crystallizes in long prismatic needles. It is insoluble in cold but soluble in hot water.

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k. Quercia,

was obtained by me from Oak-Bark (Quercus robur) in which it is united with gallic acid inert substances and a peculiar colouring matter (Quercin) hereafter to be described. The invigorating properties of oak bark gratuitously attributed to tannin in our Pharmacopœias are unquestionably dependent on this alkali. I presume from analogy that Quercia is per se, crystallizable, and feel confident that it will rank among our choicest tonics; the wood which affords it being procured without expense, and the alkali obtained without difficulty.

l. Angusturia.

This alkaline base I obtained in great quantity from Angustura-bark (Cusparia febrifuga). The bark furnishing it has been confidently alleged by the most respectable practitioners of the West Indies to possess a decided superiority

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viz Cinchona, in the treatment of intermittent fevers. In scarcity we need not hesitate in assuming that Angusturia if not more serviceable than Quinia will at least prove a substitute of convenient value. Angusturia on which I have made [illegible] dissolution & subsequent examination crystallises in minute deliquescent fibrils.

Sulphate of Angusturia aggregates in Stars.

m. Cerasia.

This alkali was separated in the state of Sulphate from the wild cherry tree bark in which it probably exists combined with hydrocyanic acid. The only combination I examined was the Sulphate. This however sufficed to convince me of its alkalinity and to this principle may be referred the medical activity & not as [illegible] supposes to the prussic acid which is merely supposed to exist in the bark.

n. Crotonia.

The alkali, in which reside the [illegible] and

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and tonic energy of the Croton eleutheria or Cascarilla bark, was detected by me and isolated by the process so often alluded to. After being pressed in soaking paper dissolved in boiling water and recrystallized the Sulphate of Crotonia appeared in long acuminated prisms interlacing each other.

o. Canellia.

From the Canella alba I extracted an alkaline base by means of Sulphuric acid. Like Sulphate of Crotonia it presented itself in delicate interwoven fibres.

p. Capsica.

A new vegetable Alkali discovered by Mr C. W. Carpenter. After numerous experiments instituted for the purpose of ascertaining the existence of a principle in red pepper, analogous to piperin he succeeded in developing a crystalline substance which he informs me is Capsica in combination with a peculiar acid.

q. Cornia

An alkali yielded in small quantity by the Cornus Florida and discovered by Dr. J. B. Morton is reported to have been advantageously exhibited as a substitute for Quinia. It crystallizes in quadrangular prisms.

r. <u>Morphia</u>.

The alkaline anodyne principle was discovered by Sertuerner in opium, from which it may be isolated by boiling an aqueous [illegible] solution of opium with magnesia and filtering: the matter remaining on the filter is to be treated with boiling alcohol which takes up the alkali and deposits it on cooling in pyramids and four-sided prisms.

s. Brucia.

Was first observed by Pelletier and Caventou in the bark of the Brucia Antidysenterica and in the nux vomica and bean of St. Ignatius. In the two last, it is found in company with

Strychnia from which it may be distinguished by its being more easily soluble, and leſs deleterious to the Animal economy. It crystallizes in oblique prisms with parallelogrammatic bases.

t. Strychnia.

The alkali which exists in the nux vomica and bean of St Ignatius, in combination with a crystallizable acid (the igasuric) may be obtained by any of the proceſses employed for the isolation of Morphia. It is found in prismatic crystals, terminated by quadrangular pyramids. It is a horrible and intensely bitter poison.

u Picrotoxia

was first separated by Boullay from the Cocculus indicus. It crystallizes in prisms and may be converted by nitric into oxalic acid.

v. Atropia.

It has been a point at iſsue whether the active narcotic principle of Belladonna be a

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be alkaline. It is decidedly so — I procured two of its salts the sulphate and the muriate: The former is soluble in water and crystallizes in slender prisms: the latter is nearly insoluble and forms brilliant silky needles.

Both these salts as well as Atropia are destructive of animal life.

w. Daphnia.

detected by Vauquelin in the bark of the Daphne alpina, saturates the acids, and forms a class of neutral salts.

x. Solania

Obtained by Desfosses from the solanum dulcamara in the form of a white opaque powder possesses but feeble claims to alkalinity: its salts are all insusceptible of crystallization and the change effected by it on Sirup of violets is scarcely appreciable.

y. Hyoscyama Cicutia & Aconita, the supposed alkaline bases of black henbane, hemlock and

monk's hood were reported some time ago in the European periodicals to have been discovered by Brande. They have not however stood the test of rigid scrutiny — no chemist has since been able to procure cicutia.

Species 4.

Proximate principles neither acid nor alkaline.

Piperin.

This term is given to a neutral crystalline matter existing in black pepper. Mr G. W. Carpenter, who published a good and elaborate memoir on the preparation and properties of this article, employs the following formula for its isolation. It may be obtained by digesting pepper in alcohol, evaporating, adding very dilute hydrochloric acid, and concentrating the solution by evaporation: on adding potash to neutralize the acid, piperin falls. It has been extensively employed

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in intermittent fever & is said to be an invaluable tonic. Per se however Piperin is totally inert and is indebted for its tonic property to a portion of etherial oil almost inseparably adherent to it.

Cathartin.

The purgative principle of Senna is yellow "nauseabonde" and uncrystallizable, soluble in any proportion in water and alcohol, insoluble in ether, and attractive of humidity from the atmosphere. The persulphate of iron strikes a fine brown colour with its aqueous solution. (Lassaigne)

Rhabarbarin.

A barbarous term for an inert powder found in Rhubarb. ~~which~~! M. Nani its discoverer very prudently cautions the public to use but little of it, two grains being sufficient for a dose. Mr Carpenter took twenty grains of it with no more effect tha

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Galanin.

The discovery of this substance forms such another epoch in chemical science as Rhubarbarin. Tho' the gazettes eulogized it, and a few practitioners extolled it as the very flower of Cathartics, it has been found to be "Sulphate of Ammonia.

Nicotin.

It is inconceivable how a Chemist so deservedly illustrious as Mr Vauquelin could fabricate a proceſs so palpably absurd as that which he has contrived for the developement of Nicotin; and what appears still more anomalous if poſsible is that Chemical compilers should thoughtleſsly adopt and republish an operation whose glaring inconsistencies a child might indicate.

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* See Experiments on Rhubarb. Chapman's journal for Feb: 1828.

The following is a list of neutral principles, some of which obtained in crystals and all of which may be easily obtained, by the process noticed for the development of the volatile oils. In a state of purity they are nearly insipid; and as all the remedial energy of substances which furnish them depends on an essential oil, it will be superfluous to mention more than their names, and indicate at the same time the plants affording them.

Capsicin --- from -- Capsicum.
Cubebin - - - Cubebs
Calamin — — Calamus aromaticus
Caryophyllin - . Cloves.
Zingiberin - - Ginger.
Sinapin - — — - Mustard.
Myristicin Mace.
Piperin - — Pepper.

These substances invariably exist in combination with Eth: oils but are never found in company

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Quercin.

This substance I obtained during my attempt to separate Quercia from oak bark. On boiling the rasped bark in water, rendered tart by sulphuric acid, and filtering during ebullition, a yellow powder, Quercin, mixed with the alkali of oak, precipitated in great quantity on cooling.

Quercin is insoluble in cold water, soluble in hot, of a bitter taste and a peculiar smell. It stains paper of a yellow colour little inferior in brilliancy to that of gamboge.

The isolation of this pigment is said to be an object of great request and importance to the arts.

Narcotin

The stupefying matter of opium discovered by Derosne may be obtained by

digesting opium in Ether. It crystallizes in rectangular prisms with rhomboid bases. Serturner considers narcotin to be the meconate of Morphia.

Asparagin,

obtained by Robiquet and Vauquelin from the asparagus and potatoe, Crystallizes in rhomboidal prisms. Stimulates the salivary glands when chewed, and dissolves in hot water.

Agedoite

discovered by Robiquet in liquorice, is crystalline, colourless, insipid, insoluble in water and dissolves without alteration in Nitric and Sulphuric acids.

Gentianin.

From the number of substances employed and the tediousness and intricacy, not to mention the absurdity, of the process represented as essential to the development of th

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of this blends principle. I am inclined to consider it rather as an educt than a product. The sanative efficacy of gentian resides in the alkali which I obtained from it.

Scillitin

found by Vogel in the Squill; is bitter viscous white, resinous and deliquescent.

Caffein

a Crystallizable matter, observed by Robiquet in the Coffea Arabica and but loosely examined by him; is white, and insoluble in Cold water.

Emetin.

To a principle bearing this name, Ipecacuanha is indebted for its emetic quality. Pelletier its discoverer describes it as being white crystalline and very feebly if at all alkaline.

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Genus IV. Oxygenea.

Proximate principles in which Oxygen is predominant.

Vegetable Acids.

It is highly Culpable in a Chemist to indulge in the vanities of hypothesis; generalization is unwarrantable, and analogy itself unsanctioned by experiment should be employed to a very limited extent. Thus Thenard, by promulgating the error in vegetable Chemistry into which Lavoisier had fallen in the mineral department: viz. that oxygen is the only acidifying base, errs in his assumption, that "if oxygen be in a greater ratio to the hydrogen than in water the Compound will be found acid". Succinic Benzoic and Prussic acids contain more hydrogen than is necessary to Convert their oxygen into water and yet they are all

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diminished acid. Under this section however I shall class them, as they are analogous in their Chemical relations to the other acids.

a. Gallic Acid.

This acid abounds in the nut-gall, in combination with tannin, from which it may be extracted by sublimation. An aqueous infusion of galls, after a few months exposure to the atmosphere, deposits it in white luminous Crystals. It may be obtained, in considerable quantity from the lettuce in which it exists probably in the state of bigallate with an anodyne alkali which I have hitherto vainly attempted to isolate tho' my attempts have been so frequently abortive from the mass of glutinous extractive matter that masques and envelops it.

The most distinctive property of gallic acid is that of precipitating iron from its solutions na

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and striking with it a jet-black colour.

b. Oxalic Acid

is found in the oxalis acetosella and corniculata in which it exists as a binoxalate of potassa. It is however commonly obtained by reaction of nitric acid with sugar or starch. It crystallizes in four sided prisms.

c. Benzoic acid

is a sublimate obtained from the Styrax benzoe and balsams of Tolu & Peru. It appears in white [illegible].

d. Citric acid

is ordinarily procured from lemon or lime juice, in which it is combined with malic acid. It is crystallizable.

e. Tartaric acid

is found in wines and in the grape in the state of bitartrate of potassa. It is susceptible of a crystalline form and has the property of forming a pyro-tartaric zeu

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acid, which does not precipitate the acetate of lead.

8. Malic Acid-

predominates in the apple the pear, the cider and the barberry and in unripe fruits. It is suspected by Vogel and Bouillon Lagrange that this acid is acetic combined with vegetable matters which disguise it— the suspicion is gratuitous. Malic acid is uncrystallizable, but affords to distillation a crystalline pyro=malic acid, and forms nearly insoluble salts with lead mercury and silver— This is not the case with acetic acid.

9. Mucic acid,

Called by Scheele saccholactic is a factitious acid formed by action of nitric acid with sugar of milk gums resins and mucus. It groups in white needle=form crystals and gives off pyro=mucic acid when

subjected to heat.

h. Camphoric and Suberic acids

are artificially developed by reaction of Nitric acid with camphor and cork.

i Fungic Acid

found by Braconnot in the mushroom combined with potash is very sour and deliquescent.

j Jatrophic acid (Pelletier)

Abounds in the seeds of the Jatropha Curcas. It is uncrystallizable

k Meconic acid [illegible]

occurs in opium. The magnesian precipitate, which falls during the process for obtaining ~~opium~~ Morphia, holds meconic acid in the state of Sub-meconate. It crystallizes in reddish scales or plates and strikes a red hue with ferruginous solutions.

l. Sorbic acid (Donovan)

is met with in the berries of the

Sorbus Aucuparia and in apples. It may be precipitated from the Sorbus by Sub-acetate of lead. A current of Sulphuretted hydrogen passed thro the bi-sorbate of lead seizes on the metal and isolates the acid. Sorbic acid is scarcely crystallizable: it bears some resemblance to malic acid with which Braconnot supposes it to be identic.

m. Moric or Moroxylic acid

is found in an exudation from the Morus alba. It is white and crystalline.

n. Igasuric acid (Pelletier & Caventou)

neutralizes Strychnia in the nux vomica and bean of St. Ignatius. It crystallizes in minute white needles

o. Menispermic acid (Boullay)

occurs in combination with picrotoxia in the Cocculus Indicus.

1. Kinic acid. [illegible]

Observed in the extract of Quinquina, possesses a crystalline structure and precipitates iron from its solutions, striking with it a rich green colour. By aid of heat it forms a crystalline pyro=kinic acid.

2. Kinovic Acid Pelletier

has been separated from the Kina nova.

3. Succinic acid

tho generally classed among mineral acids might with more propriety be arranged with organic products as amber of which it is a sublimate is evidently of vegetable origin. It forms yellow prismatic crystals of a nauseous acid taste.

4. Aceric acid

is supposed to exist in the juice of the Maple.

5. Boletic Acid.

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existence of a peculiar acid principle in the Boletus pseudo-igniarius. It is susceptible of sublimation and crystallization.

u. Krameric acid

was found by Peschier in the astringent root of the Krameria triandra.

v. Prussic, Hydrocyanic, or Hydrazocarburic acid, has been detected in bitter almonds laurel and peach leaves, and in a number of flowers, with ferro-cyanate of potash, it furnishes a beautiful blue colour. It is a shocking poison, developing the most serious phenomena on the nervous system.

w. To these acids I might add Quassic Gentic Serpentaric Columbic (which is crystalline and forms a pyro-Columbic) Atropic Quercic, Nicotic & Digitalic, all of which I obtained them in so small a quantity as to preclude an extensive investigation of their peculiarities.

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Genus V. Hydroxyacere.

Proximate principles in which oxygen and hydrogen combine in the proportion neceſsary to form water.

Species 1.

Fecula.

This species exists ready formed in such vegetables as contain it. In order to give a free exit to the Starch the parenchyma should be torn up by rasping or grinding, and the powdered grain steeped in water and strained. This done, the liquor which paſses, after standing some time deposits the Starch.

Pure Starch is snow white, inodorous and nearly insipid. It is not dissolved by cold water but forms a thick gelatinous solution with that fluid when hot. By admixture with a caustic alkali the solution loses its consistency but recovers it on the addition

of an acid. It is insoluble in alcohol or ether and Convertible into sugar by boiling with dilute sulphuric acid.

Kirchhoff obtained a Crystalline sugar from Starch by long continued boiling with gluten. Exposed to a temperature of 220. Starch acquires a blush, and exhales the odour of baked bread. To this torrefied fecula, Saussure has applied the term Amydine; and Caventou maintains that Starch gelatinized with hot water undergoes a similar Change and is identic with amydine: 1° because from neither of these States can Starch be recovered 2° from a presumption that it is amydine and not Starch which has the property of producing a blue colour with iodine. This distinguished Chemist does not shrink from experiment. His first statement is too general and vague, and found is erroneous — for if a small portion of Iodine be diffused thro cold water in a glass vessel holding Starch in suspension, and left quiescent for some time,

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Coin

it will acquire an elegant blue colour the result of iodic action on Starch.

Hordein

A variety of fecula observed by Proust in barley. It is a yellow arid powder, convertible into Starch and Sugar by the germination of barley.

Fragopyrein.

This Species of Starch is obtained from Buckwheat (Fragopyrum). It is somewhat analogous to hordein and may be distinguished by its solubility in hot alcohol.

Oryzein

An amylaceous substance which Is procured from rice, dissolves in cold water without forming a gelatine and strikes a blue with iodine.

Zein

a peculiar Starch existing in Indian Corn is soluble in proof Spirit.

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Ulmin.

found in an exudation from the elm, is solid tasteless black and brilliant soluble in water and insoluble in alcohol. Pure potassa triturated with sawdust furnishes ulmin, by abstracting from lignin oxygen and hydrogen in the proportion of water.

Inulin,

extracted by Rose from the root of the Elecampane dissolves in hot water without producing viscidity and precipitates on refrigeration. It strikes a green colour with iodine and is dissolved without decomposition by Sulphuric acid.

Species 2

Gums,

in a state of purity, are insoluble in alcohol ~~and~~ or ether, soluble in the oils and in water, forming with the latter mucilage and passing speedily from the

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aqueous solution into acetous fermentation. By distillation they furnish an impure acetic acid, which has been called pyromucic, and by reaction with nitric acid their elements form new combinations attended by the production of Malic, Mucic, and oxalic acids.

Cerasin

A generic term applied to such gums as are insoluble in cold water, but analogous in every other respect to common gum.

Saccogummite.

A sweet gummoid matter remarked by Robiquet in liquorice. It is yellow and solid insoluble in cold water and alcohol but soluble in both these fluids when hot.

Species 3.

Sugar.

The principle which forms the nutritious portion of the vegetable secretions, is commonly extracted from the arundo

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Saccharifera or Sugarcane in which there exist two distinct varieties—viz; a crystallizable and an uncrystallizable Sugar. The former is called raw Sugar Muscovado, loaf Sugar &c; the latter Melasses or treacle.

When Sugar is perfectly detached from bran, gelatine gluten, and saccho-mucous matter it crystallizes in incomplete cuneiform octoëdra or in tetraëdral prisms. It is diaphanous, Soluble in all proportions in water Slightly soluble in alcohol and becomes phosphorescent by friction. Long exposure to the heat of boiling water robs it of the property of crystallizing. Sugar dissolved in hot water has the property of restoring to the metallic State several oxidized metals, and metallic salts. The oxides of Copper so pernicious to animal life, are reduced and rendered innocent by Sugar—hence it may be advantageously exhibited as an antidote

Mannite.

Sugar of Manna has the property of dissolving the yellow oxide of lead and of acting like an alkali on vegetable blues. It is soluble in boiling water and alcohol, but on cooling falls in crystalline flocks.

Fungile.

Sugar of Mushrooms possesses some peculiarities — It is white crystalline and efflorescent.

Honey

is by some considered a vegetable sugar, by others an animal product. That it undergoes some modification in the stomach or honey bag of the bee scarce admits of a doubt, but that it is essentially of vegetable origin may be demonstrated as well by the untutored peasant who sucks it from the flower blossom or observes it in the honey dew, as by the physiologist who demonstrates on the plant

the nectary, the melliferous glands, and the whole complicated apparatus which nature has constructed for the defence of a fluid, so indispensable to the vegetable economy. Honey, obtained from poisonous or narcotic plants, retains their deleterious qualities. Numberleſs examples of its loimic agency, when procured from hemlock "gelida collectum flore Cicutā", are recorded by the Greek and Roman writers. It is stated by Perotto, a lexicographer of the 15th Century, that the honey of bees frequenting the Rhodendron occasions a peculiar kind of madneſs, called Mainomenon.

Honey, like sugar, consists of a Crystallizable and an uncrystallizable portion; and, like sugar is convertible into malic and oxalic acids, by reaction with nitric acid.

Sarcocollin,

Obtained from the Sarcocoll

is brown, brittle, unctuous, and of a sweetish bitter taste.

Olivile,

observed by Pelletier in the gum-resin of the olive, is white, brilliant, and Crystalloid, tasting like sarcocollin.

Thus have I completed a rapid and succinct sketch of a science, which owes its existence to the nineteenth century; one which has already tendered the most signal services to suffering humanity; and one which holds out the golden promise of becoming the most important, as it unquestionably is the most useful, branch of its generic Science.